Synthesis of metal nanoparticles and their influence on optical properties of organic dyes

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Recently, silver nanoparticles (AgNP) have attracted much attention because of their unique size and shape dependent optical [1], electrical and magnetic properties. Possible manipulations of these properties lead to various applications of AgNP in optoelectronics, biosensing, catalysis, enhanced optical spectroscopies [2], as antimicrobials [3] and other [4]. For practical use it is crucial to understand the influence of size, shape, aggregation, stability [5] and other features of nanoparticles on their optical properties.

In this work, the influence of spherical and triangular AgNP on optical properties of highly fluorescent organic dyes (rhodamine 6G (R6G), sulforhodamine 640 (SR640)) was investigated. Spherical AgNP were prepared using wet-chemistry techniques: reduction of silver salt ($AgNO_3$ + $NaBH_4$ → Ag + H_2 + B_2H_6 + $NaNO_3$), Turkevich method ($4Ag^+ + Na_3C_6H_5O_7 + 2H_2O \rightarrow 4Ag° + C_6H_5O_7H_3 + 3Na^+ + H^+ + O_2$). Three different in size triangular AgNP were synthesized using different concentrations of $AgNO_3$, $NaBH_4$, $Na_3C_6H_5O_7$ and H_2O_2. Solutions of nanoparticles and organic dyes were investigated by using steady-state and ultrafast time-resolved absorption and fluorescence spectroscopy (Fig).

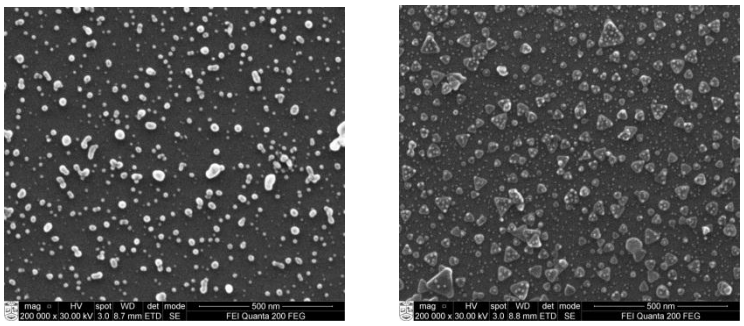

Fig. SEM images of spherical (left) and triangular (right) silver nanoparticles

References

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